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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •

FEBRUARY 18, 1933

Evangeline the Vamp

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Edited by WATSON DAVIS

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DO YOU KNOW?

Chewing gum made by a new formula has a rubber composition base mixed with fat or wax.

Experiments indicate that some varieties of apple contain more vitamin C than others.

A new wood pulp material has properties similar to celluloid and is being used in manufacture of toys.

The National Collection of Heads and Horns in the New York Zoological Park has been called the most complete collection of wild game trophies in the world.

The highest weather station ever maintained was on the top of El Misti, a Peruvian volcanic mountain 19,200 feet above sea level.

Experiments show that high quality garden peas are better for commercial freezing than the varieties of peas ordinarily grown for canning.

Poultry specialists find that a spray containing chlorine gas is an effective method of fighting bronchitis, colds and other respiratory diseases in poultry.

Cornell University has received a table 15 feet long made of woods contributed by twenty countries.

The Gothic style of architecture may be traced to Persian origins, it appears from recent studies of Persian buildings.

In the United States, 21,000,000 acres of land have gone out of cultivation because of erosion, an area exceeding the total arable land in Japan proper.

There are about 33 million more acres of forest land in the United States now than there were in 1920, largely because much farm land has reverted to forest.

Concentrated milk, which can be kept frozen for a week or more and then thawed out and diluted for serving, is a valuable aid on ships where fresh milk is hard to keep.

Workmen excavating for a building in London have found a stone altar used by a family worshipping Roman gods in Britain in the first or second century A.D.

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These curiosity-arousing questions will be especially valuable to the teacher. Book references in italic type are not sources of information of the article, but are references for further reading. Books cited can be supplied by Librarian, Science Service, at publishers' prices, prepaid in U. S.

ASTRONOMY

Astronomers Push Study Of Atmosphere on Planets

Other Atmospheres Do Not Reveal Oxygen, Important And Common on Earth; Carbon Dioxide Abounds on Venus

TO THE PERENNIAL discussion of the possibility of life on the planets other than the earth, recent researches at Mt. Wilson Observatory are presenting new data. As yet the astronomers are not considering the "life" question, but with telescopes and thermocouples they are attempting to discover the nature of the atmospheres of the planets.

Whether a planet can hold an atmosphere or not depends very critically on its size and its temperature. For example, an atmosphere which might remain practically unchanged on a planet at 100 degrees absolute (-173°C.) would escape in a few months if the temperature were increased to 300 degrees absolute, which is about the surface temperature of the earth.

Temperature measurements of the planets have been made by Dr. S. Nicholson of the Mt. Wilson Observatory so that we have a good idea which planets have an atmosphere and which have none. Thus, excepting Mercury and Mars, all the planets might well have a gaseous envelope which we call an atmosphere.

Moon in Vacuum

Incidentally our own satellite, the moon, is too small and becomes too warm to retain an atmosphere. The surface of the moon is therefore in a vacuum and not even liquids can exist there unless they be of extremely high molecular weight.

Even those planets which have atmospheres will differ greatly from the earth. Drs. W. S. Adams and T. Dunham, Jr., of the Mt. Wilson staff are investigating the composition of the various atmospheres. One of the most striking conclusions of their observations is that oxygen, which plays such a vital role in the earth's atmosphere, does not show itself in the other atmospheres. Elements like nitrogen, hydrogen, helium and argon are much more difficult to observe, so it is not surprising that they do not appear in the planetary atmospheres.

Venus has an extraordinary amount of carbon dioxide. This gas, which occurs to the extent of less than one tenth of one per cent. at sea level on earth and which because of its weight must be practically absent at high levels of the earth's air, gives an intense spectrum in the atmosphere above the clouds which hide the surface of Venus from our view. Only recently has Dr. Dunham succeeded in getting enough carbon dioxide into a tube to get a trace of those bands which come out so strongly in Venus. He estimates it would take a tube at least a mile long filled with CO_2 at atmospheric pressure to duplicate the spectrum of Venus.

Gases Unknown Here

The outer planets are much colder than Venus. Carbon dioxide would scarcely be a gas on them, but it would mostly condense to a solid. The analysis of the atmospheres of the outer planets is difficult. These planets are so much farther out that they reflect at least fifty times less of the sun's light into the powerful telescopes. Astronomers are forced to be satisfied at present with mere indications. The chemical compounds which would be gaseous at the temperatures of Jupiter (-135°C), Saturn (-150°C), Uranus (-180°C) and Neptune (*Turn to Page* 108)

CHEMISTRY

Three Rare Earth Elements Proved to be Radioactive

THREE NEW rare earth elements can now be listed among the radioactive substances of the earth as the result of experiments by W. F. Libby, University of California teaching fellow, and Prof. W. M. Latimer, also of the University of California faculty.

They are lanthanum, neodymium and samarium. Except for samarium which was proved radioactive by independent European research a few months ago, this is the first time that these elements were known to spontaneously disintegrate in a manner similar to radium and uranium.

Transmutation occurs when lanthanum, neodymium and samarium disintegrate, some of their substance flying off and leaving as a residue other elements, cerium, illinum and neodymium, respectively.

The radioactivity was detected by putting the elements into a container filled with low pressure helium and recording through a radio amplifier the clicks of atomic collisions that occurred. The radioactivity of the elements increased the normal number of collisions.

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ARCHAEOLOGY

Girl Explorer Adds Ancient City to Map

RUINS of one of the remote, prehistoric cities of Mexico, familiar to its Indian neighbors for many centuries, but never located on the official map of Mexico's 1,200 archaeological sites, have been explored by Emma Reh, correspondent of Science Service in Mexico. Miss Reh earlier explored the ruins of another ancient city, Teposcolula, 18 miles away.

The city bears the Aztec-sounding name of Hualmelulpan. It lies in the mountainous mazes of the region known as the Mixteca (*Turn Page*)

THIRTEEN STONE KNIFE

The squared stone is believed by Miss Reh to be the first dated monument reported in the Mixtec region of Oaxaca. It bears the date "Thirteen Stone Knife." Beside it stands a six-foot figure with grotesquely heavy mouth and curling fangs.

because of its Mixtec Indian inhabitants. The Mixteca is in the State of Oaxaca, in southern Mexico.

Miss Reh's own account of her explorations follows:

Hualmelulpan is an ancient Indian city in the Mixteca. The present town of San Martin Hualmelulpan of Mixtec-speaking Indians is built in the midst of the mounds and terraces of the ancient civilization. Old and new crowd one another.

A new road cuts an ancient stairway and penetrates an artificial mound. And on this mound the early Christian church of the village stands. Back of the church rise terraces above terraces of the old city, the last one surmounted by a pyramid. Treasure-hunting Indians have quartered the old pyramid.

The pyramid back of the village church, which Indians have excavated, contains a smaller pyramid within. From what can be seen of the inner structure its plaster-faced sloping walls are intact, which is unusual in such buried buildings. The treasure-seekers found an inner room in the pyramid, lined with smooth stone and a tunnel heading south. In these apertures, they say, were found idols and carvings.

These idols and carvings are now in the city hall. Most important is a slab over three feet high, carved with the date "Thirteen Stone-Knife," the numeral being expressed in the Mayan dot-and-bar system.

Mayas and Indians Linked

This stone slab, found in the heart of the Mixteca region, is an important link in the mysterious relationship between the Mayan culture and Indian civilizations in the center of Mexico. The ancient pattern of Mexico is not yet known, and the finding of this mode of writing in this place is of great significance.

Another sculpture is a human form six feet tall. The big figure has slanting eyes, triangular nose, rounded mouth with curling fangs. Tigers with snarling mouths are among the smaller sculptures.

One exquisitely carved jade figure is among the pieces picked up by villagers in their cornfields on the mounds and terraces. Small pottery heads found in the fields are handiwork of various cultural types of ancient Mexico. They can be arranged from the "Archaic" people of early time to highly evolved "Mixtec" types.

Science News Letter, February 18, 1933

ANTHROPOLOGY

Colonial America Revealed As Melting Pot by 1790 Census

Less Than Two-Thirds of Pioneers Were English; Remainder Largely Irish, Scotch, German, French and Dutch

A WIDE assortment of the ingredients for the American melting pot were already in this country when the first census was taken, back in 1790.

This fact is brought out in a study of the make-up of America in nationalities, as shown in the approximately 4,000,000 names taken in the first census. The American Council of Learned Societies sponsored the research, and the American Historical Association has just published the results.

"Many prevailing impressions regarding origins of colonial America are contradicted by this study," says Howard F. Barker, research associate of the Council and one of the authors of the work.

Less Than Two-Thirds English

The colonial fathers, dames and children who were the people of George Washington's first administration, were of English, Irish, Scotch, German, French, Dutch, and Swedish extraction. Outlying regions also had Spaniards.

The survey shows that, of the 3,200,000 white settlers, the English constituted less than two-thirds, and English, Scotch, and Irish together not much more than 80 per cent. Germans account for nine per cent., Dutchmen three per cent., Frenchmen about two per cent., and Spaniards and Swedes each about one per cent.

No consistent records of arrival of settlers were kept in those times, Dr. Barker explains. No one questioned arriving immigrants as to their nationality or their ancestry. The best method that the research historians have hit upon to identify nationalities has been to study the family names in the census. The method calls for specialized knowledge of foreign names, languages, early American history. Even by 1790, the typically American process of revising names was going on. Non-English names, especially, were likely to be simplified or translated into names of English sound.

"It is incorrect to credit colonial American population with a homogeneity which did not exist," Mr. Barker states. "But it is well to note that most of the earlyday Americans who were not from the British Isles were from the Rhine country."

Science News Letter, February 18, 1933

PHYSIOLOGY

Explains Why Raw Weather Is Painful to "Rheumatics"

COLD, MOIST AIR has a heat conductivity greater than that of cold dry air; it produces a "raw" feeling and excites the nerve endings which reflexly cause the tightening-up effect that leads to pain in rheumatic people. This is the explanation given by Sir Leonard Hill, British physiologist, in the London scientific periodical *Nature*, in answer to the query: "Why is damp cold weather unpleasant and peculiarly bad for those suffering from rheumatism?"

"Heat expands and softens the tissues, bringing more blood and lymph into the parts, while cold tightens them up," Sir Leonard said. He suggested that it is this change which leads to pain in rheumatic people.

Science News Letter, February 18, 1933

ASTRONOMY

Sunspots Hold Secret Of Understanding Stars

THE KEY to the problem of the sun's structure lies in explaining why the sun spots are giant magnets, Dr. Donald H. Menzel of the Harvard College Observatory, told the New England section of the American Physical Society. The sun is a star, similar to many that dot the heavens; and Dr. Menzel observed that it offers the only star surface that can be studied in detail.

During the past few weeks the sun has been extraordinarily spotted considering that the time of minimum of sunspots is approaching. Thirty spots in

U. S. Naval Observatory

UNUSUAL SUN SPOTS

These spots appeared on the sun when little expected near the minimum of the sunspot cycle. They may have disturbed radio reception.

four groups were observed at Mt. Wilson Observatory at one time. Dr. Seth B. Nicholson, of this Observatory, estimates that the minimum of sunspottedness will occur near the end of this year or early in 1934. The first spots of the next cycle may be expected any day now.

"Until science can answer most of the questions about the sun, it will be impossible to get a satisfactory theory of the nature of the stars," Dr. Menzel said. "Unfortunately known facts about the sun are completely overbalanced by our ignorance of solar matters. We know the sun's size, mass temperature and approximate chemical composition of outer layers. We recognize various surface features such as sunspots, atmosphere, prominences and corona.

"We do not understand why sunspots occur or what holds up the sun's atmosphere or what forces cause prominences to shoot out like volcanic eruptions, or what is the composition of the corona."

One of the clues to many of these phenomena and a clue that has not been interpreted is the existence in sunspots of enormous magnetic fields.

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MEDICINE-CHEMISTRY

Lack of Vitamin B_2, a Cause Of Pernicious Anemia

Latest Researches Also Show Victims May Eat Proper Foods But Then Fail to Absorb Vitamins in Digestive Tract

ONE CAUSE of pernicious anemia may be lack of vitamin B_2 in the diet, Dr. William B. Castle, of the Thorndike Memorial Laboratory, Boston City Hospital, and Harvard Medical School, reported to the American College of Physicians. His studies also suggest a new idea of the relation between certain vitamins and the conditions caused by their lack.

Dr. Castle received the John Phillips Memorial Prize of the College. Associated with him in the anemia research were Drs. Wilmot C. Townsend, Clark W. Heath, and Maurice B. Strauss of the Thorndike Memorial Laboratory, and Dr. C. P. Rhoads of the Rockefeller Hospital.

Liver may be a means of curing pernicious anemia, but lack of liver in the diet is not the cause of the disease. Pernicious anemia develops in those people whose stomachs cannot make their own supply of liver extract from a normal diet. When vitamin B_2 is fed to a normal human being, his stomach makes it into something that acts like liver extract because of a reaction with what Dr. Castle calls the intrinsic factor in the stomach juice. It is chiefly lack of this intrinsic factor which causes the usual cases of pernicious anemia and also some of those occurring in mothers before the birth of a child. After the child is born, however, the intrinsic factor reappears to a certain extent, as it did in one exceptional case of pernicious anemia following liver treatment.

Where Found

Vitamin B_2 is found in meat, milk, eggs, the outer layer of rice, and yeast. It is lack of this factor in the diet which produces the type of pernicious anemia found in the tropical disease, sprue, and in celiac disease, an intestinal ailment of children. The vitamin factor in the cause of pernicious anemia Dr. Castle calls the extrinsic factor.

A third important factor in the development of this disease is what Dr. Castle calls "defects of absorption." Even if the vitamin is eaten in abundance and the intrinsic factor is present in the stomach juices, the body may fail to absorb the product formed by the interaction of these two factors. This is seen in certain cases of pernicious anemia or sprue in which enormous doses of liver extract have little effect when given by mouth, whereas the usual dose given by hypodermic produces a typical response.

Dr. Castle's researches have thus shown that there are three ways in which the formerly fatal disease, pernicious anemia, may be caused. It is a deficiency disease in a novel sense, since the deficiency is not so much a lack of vitamins in the diet as the failure of a reaction with a vitamin in the digestive tract or elsewhere in the body.

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PHYSICS

Cosmic Rays Warm Bodies In Interstellar Space

ENERGY supplied by cosmic rays would raise the temperature of a body in interstellar space to 3.1 degrees over the absolute zero of temperature, Prof. E. Regener of Stuttgart, Germany, states in a letter to *Nature* basing his calculations upon new measurements of the intensity of cosmic radiation.

Dr. A. S. Eddington, Cambridge physicist, had calculated that a "black" body placed in our system of stars, but sufficiently far away from any one star in particular, would acquire an equilibrium radiation corresponding to a temperature of 3.18 degrees above the absolute zero, due to the light coming to it from all the stars. Combining the two sources of energy it is found that the temperature of a body absorbing both radiations would be 3.7 degrees absolute. The radiation is proportional to the fourth power of the temperature.

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ZOOLOGY

Outwitting Vampires and Vipers

Scientists Working in Tropics Conquer Venomous Snakes And Learn How to Fight Malady of Cattle and Horses

By JANE STAFFORD

See Front Cover

WHEN A VAMPIRE is a supernatural creature, science laughs at it. But when it is a disease-bearing bat, science sets its disease-fighters to work seeking a way to conquer it.

Down in Panama, the disease-fighters of the Gorgas Memorial Institute, in addition to carrying on their regular job of fighting malaria, have lately been having a bout with the vampire bats and the vipers that make mischief for the unwary in their tropical neighborhood.

The vampire bat of Panama (the Gorgas Memorial disease-fighters call her Evangeline the Vamp) is a small, mouse-sized creature that makes or takes her living from cattle, horses and mules. This would be bad enough in itself, but the Panama vampire has now been found guilty of carrying the disease, murrina, from infected cattle or horses to healthy horses.

Now murrina, also known as derrengadera and trypanosomiasis, seems to be a disease of horses and mules but it is related to fatal African trypanosomiasis or sleeping sickness of men. That long, seven-syllable word is not hard to pronounce; just put the accent on the second and fifth syllables and you will find it has quite a poetic swing. Both African and Panaman diseases are caused by the same kind of organism or germ, called a trypanosome. Consequently when the disease was discovered killing off horses in Panama, the scientists of the Gorgas Memorial Institute Laboratory down here took an interest beyond that of possibly saving valuable herds of horses.

Evangeline the Vamp

Evangeline the Vamp did not come into the picture for some time. African trypanosomiasis is carried by the tsetse fly. Insects play an important role in the transmission of many diseases, a notable example being mosquitoes in yellow fever and malaria. So of course it was supposed that some sort of fly transmitted trypanosomiasis or murrina in Panama. The staff of the Gorgas laboratory was already accustomed to fighting mosquitoes, and it was only natural that they were drawn into the search for and fight against whatever winged insect transmitted murrina.

Dr. H. C. Clark, director of the laboratory, recently told his board of directors how the search for the guilty fly or other insect went on for more than 20 years. The disease, murrina, has been known a long time in Panama and the north coast of South America. In 1909 a scientist named Samuel T. Darling was first in Panama to discover that it was due to a trypanosome. Since then scientists have found some mechanical means for the transfer of the disease, but they were unable to prove or disprove definitely that insects might be natural carriers.

They finally had to rule out the insects, except the common horse flies of the region. Circumstances point to them as possibilities, but the fact that the epidemics of murrina were not explosive and did not occur at definite seasons made it seem unlikely that the fly was the chief carrier, if he transmits the disease at all.

Seemed Like Heresy

So Dr. Clark and his associates next turned their attention to the only blood feeder left that commonly attacked horses, mules and cattle, the vampire bat. It seemed to them like medical heresy to suspect this mammal of carrying the disease. The only other two known mammalian vectors of disease are the dog that transmits rabies and the rat that transmits rat-bite fever. Certain other mammals, including rats, play important parts in the spread of other diseases, but the actual transmission is by insects. Yet Dr. Clark and Laurence H. Dunn of his staff have now established the fact that vampire bats can and do transmit murrina.

They had to circumvent many difficulties before reaching this point, however. For one thing, the vampire bat is apparently a very shy creature, appears only at night, of course, and after eating, or rather, drinking her fill of blood from her victim, retires to her hideout in some inaccessible cave.

Prior to January, 1932, it had not been possible for the scientists to get more than ten of the creatures, dead or alive, for their study. But during the present year a gruesome clue related to their feeding habits led Dr. Clark's men to the caves where the bats lived, and they were able to secure thirty-two of them in an unharmed state. Studies of these led to the discovery of the vampire's role in the spread of murrina, and incidentally, Dr. Clark and associates were able to throw new light on the habits and anatomy of the creatures themselves.

Even Attacked Men

For example, these bats have only one young at a time. They will apparently feed on anything that has blood in it. When they attack men, they limit themselves to fingers and toes. Dr. Clark only knew of thirteen persons who had been attacked by this type of vampire, however, as the bats seem to prefer cattle. But they have been known to try to get a meal from a pelican, when they could catch that bird asleep. In such a case, they fed on the web between the pelican's toes.

"Evangeline the Vamp" is a little thing, about the size of a mouse and with a face something like a pug dog's. She has not nearly the ferocious look of her cousin the carnivorous and fruit bat of Panama whom the Gorgas Institute scientists have labelled Constance the Cannibal. Constance's body, exclusive of the wings, is about the size of a quart jar. She has an ugly horn-like excrescence growing out of her nose, and four vicious teeth, but she is probably not nearly so dangerous as Evangeline, because, so far as known, she does not carry any disease. Furthermore, she will eat fruit if she cannot get animal food easily.

The vampire can live only on animal blood, her gullet being too narrow for anything solid to pass down it. Her teeth are also peculiar and seem especially adapted to her method of obtaining food. Instead of having two sharp biting teeth at either side, she has a long, slender, pointed one in the middle, admirably suited for stabbing.

GREATEST RISK

A snake farm expert is holding a fer-de-lance, source of greatest danger in Panama because it is most numerous; but its poison is counteracted by an antivenin that is also effective against the venom of other snakes

She does a neat job, too, making a stab-like incision with her sharp upper tooth as efficiently and with about as little pain as a surgeon might with a blood-letting instrument. When the vampire's bite hurts, it is because the wound was inflicted by a young bat with a tooth not strong enough to strike blood at the first stab, Dr. Clark found. Young vampires must occasionally stab two or three times before getting a meal.

Evangeline is not really a blood-sucker, but, properly, a blood-licker. Her feeding habits are particularly favorable to spreading disease because after stabbing her victim she licks around the wound for an hour or two until satiated. During the course of the licking, she may infect her victim with the deadly trypanosome which is in her saliva. But even if she is carrying the trypanosomes, she may not infect her victim. If she feeds from below the wound, for example, or if she has pierced a vein or an artery so that the blood is running freely, she does not need to lick, but gets enough without. It is the licking process that helps transmit the disease germs.

The vampire bats get the germs into their systems when they feed on infected cattle. The cattle of Panama apparently constitute the chief reservoir of murrina. They may be infected with the germs of trypanosomiasis without becoming ill themselves. Horses and mules commonly graze with the cattle in Panama and are left out in the pastures at night, where bats may attack them as easily as the cattle.

Apparently there is some justice in the situation, for the vampire bats do not escape the effects of the malady themselves. However, they may live and carry the germs in their bodies for a month before dying of the disease, Dr. Clark found. During this time the germs incubate for about ten days and then make their way from the bat's stomach to the saliva. The bat's appetite remains entirely unaffected during this period, so there is ample time for it to pass the disease on to uninfected animals on which it may feed.

As a result of their investigations this year, Dr. Clark and associates were able to advise Panaman horse-owners how to protect their animals from the fatal disease. Horses and mules should not be allowed to range with cattle during the night hours. They should be stabled in barns screened with a wire mesh not greater than one inch, or well-lighted by electric bulbs or clean lanterns. These measures will prevent bat attacks.

"Modern treatment of the disease is now attended with some success," Dr. Clark reported. "We had formerly not been able to save an animal infected with the disease but during the past two years the use of jugular vein injections of certain trypanocides has resulted in the cure of about one-third of the animals in one afflicted herd and of about one-half of the afflicted animals in a second herd."

Snake Population Surveyed

Vampire bats, however, are not the only nuisance in Panama, and the Gorgas Institute disease fighters have recently lent a hand in efforts to keep the vipers or poison snakes of the region from making mischief for the unwary. Antivenin, a serum treatment for snake-bite accidents, is rather a specific remedy, it seems. When made from the venin or poison of one snake it may not be effective in treating the bite of some other species of snake.

Scientists who try to protect people from the effects of snake-bite want to know exactly what poison snakes are the chief danger in a given locality. They also want a simple means of distinguishing between snakes, so that a non-scientific person travelling through the tropics will be able to identify the viper that bit him and thus apply the right kind of antivenin. It is with this identification and snake-population survey that Dr. Clark and associates have recently been lending a hand.

They have collected 1,170 snakes from the valleys of the Chagres, Tuira and Santa Maria Rivers in the Republic of Panama, of which 405 were found to be of poisonous species. This gives an incidence of 34.6 per cent. In other words, of every ten snakes in these valleys, between three and four are poisonous.

Most numerous, and consequently the greatest snake-bite risk, are the fer-de-lance snakes. The bushmaster, however, is said to be the most poisonous, because of the bulk of venom it carries.

Bites from all but the bushmaster and coral snake can be treated by one kind of antivenin. The bushmaster requires a specific antivenin of its own.

Identification

Dr. Clark has noted a few easily-remembered distinguishing marks of fer-de-lance and bushmaster. The head of the fer-de-lance is spear or lance-shaped, whence it gets its Spanish name, lance-head. The bushmaster has a goose-shaped head. The bushmaster is brown, and its scales have the same diameter in all directions and a high keel, like an alligator's. The fer-de-lance is black and has feather-shaped scales. Another poison snake of Panama is the coral snake, but there are several snakes resembling this viper in coloring. However, when the black bands of the coral snake are split by a line of light color, the snake is one of the non-poisonous variety. The poisonous coral snake has solid black bands around its brilliant body.

Nature provides a fairly good safeguard against the poison snakes of Panama, Dr. Clark pointed out, in that they are all night feeders. People bitten during daytime hours are very apt to be bitten by a snake that has very little venom left following its night feeding period.

Another of nature's provisions for protection against poisonous vipers is the cazadora, commonly called the police snake. This is a large non-poisonous snake colored a deep navy blue. It can kill all the other snakes and does.

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ENTOMOLOGY-PLANT PATHOLOGY

Plant Pests and Disease Kept Out of Country

VIGILANT sentinels of science on all the borders of the United States stopped over twelve thousand invasions of American territory by insect pests and fungus diseases of plants in a single year. A detailed report of the period covered—July 1, 1931 to June 30, 1932—has just been published by the U. S. Department of Agriculture.

At least eight distinct species of fruit flies were stopped, as stowaways on a long list of fruits and vegetables from an even longer list of foreign ports. Most prominent among them was the Mediterranean fruit fly, whose outbreak a few years ago in Florida caused a serious situation and was suppressed only with much labor and expense. This world-distributed pest was detected on fruits from Algeria, France, the Azores, Bermuda, Hawaii, Italy, Spain and Venezuela.

As yet, the airplane appears to be of relatively little importance as a means of invasion by pests and plant diseases. Of the total twelve thousand interceptions made, only ninety of insects and three of plant diseases came by plane. Nevertheless, because of the rapidity with which a plane can move from infested to uninfested areas, it is necessary to watch air traffic closely.

Twice as many interceptions were made of insects as of plant diseases: 8,000 as against 4,000. The largest number of insect interceptions, 3,191, originated in North America, but the high score for plant diseases, 2,328, goes to European ports. South America was lowest in insect pests stopped, with 244, while Australasia, with only 81 interceptions, held low mark for plant diseases.

Science News Letter, February 18, 1933

PUBLIC HEALTH-ELECTRICITY

Electric Eye Watches Purity of Water Supply

TO KEEP watch over the health of of the people is a new duty of the "electric eye" described before the American Institute of Electrical Engineers by J. V. Alfriend, Jr., of the Westinghouse Electric and Manufacturing Company. Mr. Alfriend said that the "electric eye," or photoelectric cell, makes a more dependable watchman than the man it replaces.

The cell regulates the amount of chlorine that is liberated as a germ killer into the water supply of cities. Its action is prompted by color changes caused by the addition of an indicating substance.

The photoelectric cell had been used for this purpose under manual operation, Mr. Alfriend said, but this method was expensive, slow and inaccurate. Two regulation schemes have been worked out which automatically apply the corrections indicated by the photoelectric examination.

"The first or 'balanced bridge' arrangement," Mr. Alfriend explained, "utilizes two light sensitive photo tubes simultaneously to inspect the light transmitted through a sample of the unknown liquor and the light transmitted through a standard colorimetric sample representing the desired quantity of the variable chemical. The second or "null" method uses a single photo tube inspecting simultaneously the light transmitted by the unknown sample and the known sample."

Similar automatic photoelectric control has been applied to maintaining the acidity of paper mill stock solutions, holding the proper amount of sand in coal washing water, and in regulating the acidity of the electrolyte in electrochemical industries.

Science News Letter, February 18, 1933

PHYSICS

X-Ray Apparatus Improved By Commercial Insulator

CHEAPER and better high voltage X-ray apparatus promises to result from the use to which Drs. C. C. Lauritsen and Richard Crane, California Institute of Technology physicists, have put a commercial transformer insulator.

Using this porcelain tube about as tall as a man and a foot and a half inside diameter, Prof. Lauritsen has made an X-ray tube which operates successfully up to 650,000 volts. The porcelain tube was found to be more rugged than glass and less liable to puncture. Important also is the saving in space that results, since the porcelain X-ray tube can be made smaller than glass equipment.

The porcelain tube is standard electrical equipment known as a transformer bushing. Its adaptation to X-ray use is expected to allow the installation of high voltage X-ray tubes in some hospitals that might not otherwise be equipped with this device.

Science News Letter, February 18, 1933

IN SCIEN

CHEMISTRY

New Method Tells Amount Of Weighting Added to Silk

A RELIABLE method of determining the amount of metallic salts and other substances used to "weight" silk has been developed by Ralph T. Mease of the U. S. Bureau of Standards. Hot water, and weak solutions of sodium carbonate, hydrochloric and hydrofluoric acids are used to wash out the weighting and finishing materials added to the pure silk during the process of manufacture. Determination of the added material is important in testing silk textiles.

Science News Letter, February 18, 1933

PHYSICS

Real Show Backstage Where Science Marvels Perform

THE real spectacle at the new 6100-seat Radio City Music Hall in New York is behind the scenes, in the opinion of O. H. Caldwell, editor of *Electronics*, who suggests that the management might well charge admission for a visit back-stage to see the marvels of science there.

"It was the electronic tube that made Radio City possible," he says, "And Radio City's two great theatres, just completed, present the last word in applications of thousands of tubes, for sound, light control and miscellaneous uses. In the electronic installations alone, nearly half a million dollars have gone into tube and similar equipment.

"Here is the roll call for tube applications now in regular operation: thyratron control of stage and auditorium lighting; sound-picture reproduction; public-address or 're-inforcing' system; rehearsal system connecting all operating stations; paging throughout dressing rooms and back-stage; Bechstein-piano amplification; radio programs in lobbies; outlets for headphones for deaf patrons; high frequency air-conditioning; dial-controlled radio-phonograph system; private broadcast studio for Roxy's gang."

Science News Letter, February 18, 1933

ENE FIELDS

ARCHAEOLOGY

Adam and Eve Named on 3200-Year-Old Clay Tablets

MENTION of Adam and Eve and other Bible names has been found on inscribed tablets of the fourteenth century B.C. The writings belong to the period shortly after the lifetime of Moses, who led the Israelites through the wilderness toward their Promised Land of Palestine.

The tablets which have been deciphered were discovered at Ras Shamra, which is on the Syrian coast, to the north of Palestine.

The writers of the tablets had no single deity, but various gods. Among these is the Old Testament name, Elohim, which was the name for God as given in the original Hebrew in the first book of Genesis. Adam is referred to as the man from the East. This conforms to traditional geography, which places the Garden of Eden to the east of Syria and Palestine, in Mesopotamia.

The similarities to Biblical names and ideas point back to some earlier origin, which both the Hebrews and the people of Syria had in common.

Science News Letter, February 18, 1933

ORNITHOLOGY

Bald Eagle, National Bird In Need of Protection

THE BALD EAGLE, hailed in a thousand patriotic orations as America's bird of freedom, is very much in need of protection if it is not to be exterminated from the land. Only five states of the forty-eight grant it legal immunity by special act, and there is no Federal legislation whatever for its protection, notwithstanding the fact that it is the official emblem of the United States of America.

So declares the National Association of Audubon Societies, which defends the bird against charges commonly made to its disparagement. The bald eagle's occasional choice of dead fish, which sometimes replaces fresh fish in its diet, has been used as a slur on its character, but this trait, the Association points out, is actually in the eagle's favor, making it useful as a cleaner-up of beaches and stream-banks. Scientific records show that the bald eagle does little harm as a predator. It belongs to a class of large and picturesque birds that have been for many years the object of an ignorant prejudice although few do more harm than good, while the great majority are either harmless or positively beneficial in their food habits.

The bald eagle, especially, has been too long misunderstood and misrepresented, an officer of the Audubon Societies declared. Most people fail to realize the character of the actual eagle, but carry in their minds an impression of a false and imaginary bird, a fabulous creature that is an angel to politicians, a devil to game wardens, and a mythical feathered ogre out of Grimm's Fairy Tales to the rest of us.

Franklin's tirade against the bald eagle doubtless was based on pique, since Congress refused to adopt his own candidate, the wild turkey, as the emblematic national bird. Audubon, in quoting Franklin, was evidently striving to paint a colorful, well-rounded portrait, for his account likewise contains a classic appreciation of the noble bird's many admirable points.

Science News Letter, February 18, 1933

PHYSICS

Atom-Smashing Generator Built in Vacuum Tank

TREMENDOUS possibilities lie ahead for high voltage research using a large electrostatic generator operating in a vacuum, the group of Massachusetts Institute of Technology physicists engaged in high voltage research predict.

A generator, of the same type as the 10,000,000 volt giant that will soon be utilized to smash the atom, has been constructed within a tank that can be highly evacuated by a high-speed mercury condensation pump and liquid air trap. This has already been tested to 50,000 volts.

Dr. R. J. Van de Graaff who devised the electrostatic generators and his associates, Dr. Karl T. Compton, president of the M. I. T., and Dr. L. C. Van Atta expect to have the vacuum-surrounded generator in operation in a few months, and in the Physical Review they express confidence that vacuum insulation is the ultimate insulation for electrostatic devices.

Science News Letter, February 18, 1933

CHEMISTRY

New Iodine Plant Could Supply America's Needs

ENOUGH iodine to supply the entire present American market could be produced at the end of a year's expansion program of a new chemical plant recently established at Los Angeles to extract this widely used element from California oil-well brines. Its present production is several hundred pounds of iodine a day, but it can be expanded to produce 350 tons a year, the present American consumption, if this should prove necessary.

The plant has already wrecked the monopoly price formerly maintained by the Chilean nitrate corporation, which obtained iodine as a by-product of its fertilizer production. Some months ago the Chilean corporation cut its former price of $4 a pound to $3; within the past few weeks a further cut was made to the present prevailing price of $1.95 a pound.

Science News Letter, February 18, 1933

MEDICINE

Chance is Important in Development of Cancer

CHANCE is an important factor in the change of a normal cell to a cancer cell, in the opinion of Drs. M. R. Curtis, W. F. Dunning and F. D. Bullock of the Institute of Cancer Research at Columbia University.

The Columbia investigators base this opinion on studies of tumors produced in rats as a result of tapeworm infestation, which they report in *Science*.

Heredity they consider an incidental factor in the development of cancer. They suggest that the initial change from a normal to a cancer cell probably occurs by a process somewhat like that which produce bud sports on trees, for example, the one which resulted in navel oranges. Scientists call this process somatic mutation. Such a change cannot be blamed on the germ chromosomes which are concerned in heredity.

Hereditary factors determine this change, and thus play a part in cancer only in so far as they determine whether the individual will have a long or short life and whether or not he will be susceptible to some specific irritant or condition which is favorable to the change process.

Science News Letter, February 18, 1933

CHEMISTRY

Arsenic, Antimony and Bismuth

"A Classic of Science"

These Elements in One or Another of Their Compounds Were Well Known to the Alchemists of the Middle Ages

Arsenic

COLLECTION DES ANCIENS ALCHIMISTES GRECS publiée sous les auspices du Ministère de l'instruction publique par M. Berthelot, avec la Collaboration de M. Ch.-Em. Ruelle. Première Livraison, comprenant: Introduction avec planches et figures en photogravure; Indications Générales.—Traités Démocritains (Democrite, Synésius, Olympiodore); Texte Grec et Traduction Française avec variantes, notes et commentaires. Paris, Georges Steinheil, 1887.

COLLECTION OF ANCIENT GREEK ALCHEMISTS published under the auspices of the Ministry of Public Instruction by M. Berthelot[1] *with the collaboration of M. Ch.-Em. Ruelle. First part, comprising: Introduction with plates and figures in photogravure; General remarks.—Democritian Treatises (Democritus, Synesius, Olympiodorus); Greek Text and French Translation with variants, notes and commentaries. Paris . . .* 1887. *Translated for the* SCIENCE NEWS LETTER *by Helen M. Davis. This is a literal translation from the French and Greek texts.*

OLYMPIODORUS, PHILOSOPHER OF ALEXANDRIA.

FIRST TINCTURE, coloring copper white by means of arsenic, as follows.

Arsenic (sulphide) is a kind of sulphur which volatilizes quickly; that is to say, volatilizes over the fire. All substances similar to arsenic are also called sulphurs and volatile bodies. Now the preparation is made thus: taking 14 ounces of lamellar arsenic the color of gold, cut it into pieces, grind it so as to reduce it to particles as fine as down; then soak it in vinegar for two or three days and as many nights, the material being closed up in a glass vessel with a narrow neck, carefully luted at the top so that it shall not be dissipated. Shaking once or twice a day, do this for several days; then, emptying the vessel, wash with pure water, only just until the odor of vinegar has disappeared. Guard the most subtle part of the substance; and do not let it be thrown out with the water. After allowing the mass to dry and contract in the air, mix and pulverize with 5 ounces of salt of Cappadocia.

Now the use of the salt was devised by the ancients to avoid the arsenic sticking to the glass vessel. This glass vessel is called *asympoton* by Africanus. It is luted with clay; a glass cover in the shape of a cup is placed above. At the upper part, another cover envelopes the whole; it is fastened tightly on all sides, so that the distilled arsenic may not be dissipated.[2]

Then distill it repeatedly and pulverize it, until it becomes white; thus we obtain a white and compact alum.[3] Then melt the copper with some hard Nicean copper; then take some of the flower of soda and throw into the bottom of the crucible 2 or 3 parts to flux it. Next add the dry powder (sublimed arsenic), with an iron ladle; put in the amount of one ounce to 2 pounds of copper. After that, put into the crucible for each ounce of copper a little silver, with a view to making the color uniform. Then throw into the crucible again a small amount of salt. You will thus have a very fine *asem* [alloy].

Antimony

THE TRIUMPHANT CHARIOT OF ANTIMONY, being a conscientious discovery of the many real transcendent Excellencies included in that Mineral. Written by Basil Valentine[4]*, a Benedictine monke, faithfully Englished and published for the common good. By I. H. Oxon. London: Printed for W. S. and are to be sold by Samuel Thomson at the Bishop's Head in Pauls Church Yard.* 1661. *This is an exact reprint of extracts from the original publication.*

He that will write of Antimony, needs a great consideration and most ample minde, and various rules of its preparation and assured end; wherein it may with profit be used, that so he may give a certain undoubtful testimony of what is good or what is evil, what helpful and what poysonous.

'Tis no small thing truly to search out Antimony, thereby to know its essence and, at length by dilligence and experience, to obtaine the knowledge of it, to take away its poison, (so much cryed out against by the clamours of the vulgar) and by a better omen to transmute it into wholesome medicine. Many inquirers or Anatomists have hunted some here, some there, and miserably handled, tormented, and crucified Antimony, in so much that 'tis both inexpressible and incredible. But (really) they have not found out, or accomplished any profitable operation, wandring from the true end, propounding to themselves things that are false, and thereby shadowing their sight, from beeing able to discerne the mark.

Antimony may deservedly be compared (& also Mercury) to an infinite Circle, and painted with all sorts of colours, and by how much the more it is sought into, so much the more is found out and learned, (so that your progresse therein be right and true,)

[1]Berthelot is the authority on the earliest alchemists whose Greek texts are preserved in libraries of Europe. Olympiodorus was a Greek historian and alchemist who was born in Thebes, Egypt, in the latter part of the fourth century A.D. In 412 he was a member of an embassy sent by the Emperor Honorius to Attila, the Hun.

[2]This description corresponds to that of an apparatus for sublimation, formed of a lower receptacle surmounted by two covers or heads, nested one inside the other in the form of an aludel. The latter apparatus has been attributed to the Arabs; but the actual description makes it go back as far as Africanus (III century). It was carefully luted; and the part sublimed was condensed in these heads.

[3]By this operation, orpinent or sulphide of arsenic is slowly oxidized, in such a way as to change it into arsenious acid. We see that the latter is here called by the name of white alum.

[4]Basil Valentine who claimed to be a Benedictine monk, was one of the late alchemists, and was an upholder of the salt-sulphur-mercury doctrine. There is considerable mystery about him, as his name never appears in the records of members of the Benedictine order.

In a word, one mans life is too too short, perfectly to be acquainted with its mysteries.

It is the worst of Poysons, the which being separated therefrom, it becomes the supremest medicine, and is to be administered for inward and outward diseases, Which to many minds will seem incredible, and will be adjudged vanity and folly, but yet may be pardonable in them, because of their ignorance and want of judgment: but verily they are exceedingly to be blamed, who not knowing, have no desire after knowledge nor any will to learn.

Antimony hath four qualities, it is hot and cold, moist and dry, and imitates the four seasons of the year: it is also fixt and volatile: the volatile part is not void of poyson, but the fix'd part is altogether free there from.

Hence it comes to passe, that many unskilful men write that they neither know, nor understand, which may (for that reason) be adjudged monstrous, & one of the seven wonders of the world: there being none that either hitherto hath bin found or is at present to be found, who hath fundamentally learned all its faculties, virtues, and powerful operations, or hath so far tryed its force & efficacy, that nothing more may be therein seen, then he by his own experience knows. If any such can be met withall, he is well worthy to be drawn in the Triumphant Glorious Chariot of the ancient Emperours, when they had gotten some notable victories: But in my opinion the chariot Smiths are likely of but light imployment about chariots of this kind: many artificers in this age being overwhelmed with their thoughts, have sought after Riches only in Antimony, and have neglected the benefit that its wont to bring to such as are diseased, the which utility ought notwithstanding first of all to be sought after, that the wonders of the Lord may be manifested, and due thanks given unto him. It cannot indeed be denyed, but that in Antimony Riches may be found, although neither thou nor I may beleeve it, since both of us are but Scholars and Disciples in its search; although haply I have seene more therein, and experimented more, then either thou or such as thou art (that boast exceedingly much, and arrogate a large portion of Learning to themselves) are able to learn to morrow or next day; yet let none grieve at his fortune, nor despaire, for God doth wonderfully distribute his mercifull rewards; but yet the World abounds with such as are ungratefull, who contemn the blessings of God, esteeming Wealth better than true riches, and therefore God hath set a Cloud before their eyes, that such being blinded, may not know those secrets that lie hid under a Metallick Form. . . .

Now therefore, having decreed to deliver a perfect, and my absolute opinion of Antimony, I think convenient to speak a few words touching its name: Observe therefore, It was formerly called by the *Arabians, Asinat;* by the *Chaldeans, Stibium;* by the *Latines* 'tis to this day called *Antimonium;* but the Germans, (studious in their own proper Language) call it *Spisglasse,* i. e. speared or radiated Glass, because its substance is in such a form, and out of it may be made Glass (either apart, or by addition) of divers colours, lying hid therein, and educible therefrom. Let every one on that acount consider, that the Observations of the *Chaldeans, Arabians, Latines, Germans,* and other People, about Antimony, were not in vain, but that both its vertue and use might equally and deservedly be taken notice of, and 'tis very likely and credible, that by succeeding Heresie its praise and virtue died, for truth may be opprest by the enemies violence, the Devil being by God permitted to act many things, because of our Transgressions and blindness.

Bismuth

GEORGIUS AGRICOLA[5] *DE RE METALLICA translated from the first Latin edition of* 1556, *with biographical introduction, annotations and appendices upon the development of mining methods, metallurgical processes, geology, mineralogy & mining law from the earliest times to the* 16*th century, by Herbert Clark Hoover and Lou Henry Hoover. Published for the Translators by The Mining Magazine, Salisbury House, London, E.C.,* 1912. *This is an exact reprint of footnote* 59, *Book IX.*

In *Bermannus* [Agricola] says:

"Bermannus.—I will show you another kind of mineral which is numbered amongst metals, but appears to me to have been unknown to the Ancients; we call it *bisemutum.*

"Naevius.—Then in your opinion there are more kinds of metals than the seven commonly believed?

"Bermannus.—More, I consider; for this which just now I said we called *bisemutum,* cannot correctly be called *plumbum candidum* (tin) nor *nigrum* (lead), but is different from both, and is a third one. *Plumbum candidum* is whiter and *plumbum nigrum* is darker, as you see.

"Naevius.—We see that this is of the colour of *galena.*

"Ancon.—How then can *bisemutum,* as you call it, be distinguished from *galena?*

"Bermannus.—Easily; when you take it in your hands it stains them with black unless it is quite hard. The hard kind is not friable like *galena,* but can be cut. It is blacker than the kind of crude silver which we say is almost the colour of lead, and thus is different from both. Indeed, it not rarely contains some silver. It generally shows that there is silver beneath the place where it is found, and because of this our miners are accustomed to call it the 'roof of silver.' They are wont to roast this mineral, and from the better part they make metal; from the poorer part they make a pigment of a kind not to be despised."

This pigment was cobalt blue, indicating a considerable confusion of these minerals. This quotation is the first description of bismuth, and the above text the first description of bismuth treatment. There is, however, bare mention of the mineral earlier, in the following single line from the *Probierbüchlein:* "Jupiter (controls) the ores of tin and *wismundt.*" And it is noted in the *Nützliche Bergbüchlein* in association with silver.

[5]Agricola, who was not an alchemist at all, but a serious student of mining and metallurgy, wrote several books besides the famous "De Re Metallica," among them the "Bermannus," from which this description of bismuth ore is taken. The "Probierbüchlein and Nützliche Bergbüchlein" to which Mr. Hoover refers were anonymous handbooks for miners, in wide circulation in Agricola's day.

LITTLE OROHIPPUS

. . . roamed the plains of western United States during the Eocene epoch, but long before the Spaniards reintroduced the horse to this continent all descendants of Orohippus had become extinct. The Orohippus will be described by its discoverer,

O. C. Marsh

IN THE NEXT CLASSIC OF SCIENCE

MEDICINE

Bone Cancer Successfully Treated With Arsenic

A NEW CASE of successful treatment by means of colloidal arsenic of a patient suffering from cancer of the bone is reported in the *Canadian Medical Association Journal*.

The report is by Dr. A. C. Hendrick, Toronto surgeon, and Dr. E. F. Burton, professor of physics at the University of Toronto. The statement follows an announcement by the same investigators in 1931 to the effect that they had successfully treated four persons affected with bone tumor by means of injections of a colloidal solution of arsenic metal.

Details of the latest case are contained in a two-page history, which include X-ray photographs depicting the bone repair following the injections.

The patient was a married woman 22 years of age, affected with a cancerous condition of the thigh above the knee. She was first seen in November, 1930, when both bones and muscles were involved. High voltage X-ray treatment was commenced, but the condition did not improve. The thigh bone finally fractured.

Radiation was discontinued in July, 1931, when the first doses of arsenic were given. An X-ray picture the following October showed that the fracture had re-united. Three months later, the tumor had receded still more, and repair of the limb with new bone lime became apparent on the X-ray plates.

Examination of the patient's lungs last November showed that no secondary cancerous growths had occurred. This fact is considered of importance in view of the rapid course which the disease o dinarily runs. Usually, fragments of a bone sarcoma growth are distributed by the blood stream and produce tumors in other parts of the body. The report says of the patient's present condition:

"She is in good health, free from pain, and is carrying on her usual household duties."

Of the four cases treated in 1931, two are still alive.

Medical aspects of the research were handled by Dr. Hendrick. Dr. Burton was responsible for the preparation of the colloidal arsenic medicine, a delicate laboratory procedure.

Dr. G. E. Richards, associate in radiology at the University of Toronto, who has been in close touch with the work since its inception, made this comment:

"It must be remembered that cases of bone sarcoma have also been cured in the past by means of surgery, X-rays and radium. This new case with arsenic treatment is of definite interest because for the first time the results are well authenticated and fully reported. I am entirely satisfied with the diagnosis.

"Too many conclusions, however, should not be drawn from a single case, but if the arsenic treatment does no more than relieve pain, and eliminate the need for drugs, it will still be a great boon. The final test will come when there are many more cases, all carefully controlled and thoroughly checked, just as is necessary with any other new clinical treatment."

The indications are that colloidal arsenic will find its greatest use in cases of advanced bone sarcoma. The colloidal solution is now being given a large scale trial in the Toronto general hospital, from which later developments may be expected.

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SOFT-SHELL TRILOBITE?

PALEONTOLOGY

Puzzling Fossils May Have Been Soft-Shell Trilobites

LACE CRABS, strange, delicately-constructed fossil creatures that lived in the primal seas half a billion years ago, may have been merely the "soft-shell" stages of trilobites, extinct relatives of lobsters and crayfish that dominated the waters of that epoch.

This new solution for an old riddle of geology has been suggested by Dr. Rudolf Ruedemann of the New York State Museum. Working with a specially constructed microscope, Dr. Ruedemann has found evidences that the "lace crabs" had shed an outer shell, as lobsters and crabs shed their shells today. In this "soft-shell" stage they looked like creatures of an entirely different order, with wide-apart eyes on their unprotected heads, and the delicate lacy limbs that have given this fossil group its name.

The principal deposits of "lace crabs" have been found in fine-grained shales, hardened out of the mud into which the unprotected moulting trilobites settled for shelter while their new shells were forming, and where many of them were trapped and killed by pockets of water over-charged with carbonic acid.

The "lace crabs" were first described by the late Dr. Charles D. Walcott, secretary of the Smithsonian Institution. Dr. Ruedemann's suggestion that they were "soft-shell" trilobites is set forth in a recent Smithsonian publication.

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(less than -200°C), might be unstable at earth temperatures and they would thus be unknown here. The indications are that Jupiter contains ammonia gas in considerable amounts. Saturn, weaker in ammonia, seems to show methane. The outer planets have other absorp-

tion bands which have not yet been interpreted.

Astronomers would like to know of what the solid parts of the planets are composed. But the heavy clouds which cover them prevent them from seeing. The clouds themselves provide a mystery because they give no sign of their structure. Even the rings of Saturn defy us by reflecting the sunlight exactly as it comes. Unless a substance absorbs some of the light which falls on it, there is no way of knowing what it is.

The researches of Drs. Adams and Dunham help tell of climatic conditions on the planets, of temperature and density distribution, as well as chemical composition of the atmosphere. So far there is no reason to assert that the other planets vary greatly from the earth in the elements they contain. Which elements are found most readily in the atmosphere of a planet is decided by how big it was at its beginning, how hot, how far from the sun and how far from us it is now. Such accidents in its history probably determine whether it too supports some sort of life.

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SEISMOLOGY

Quake Reported Itself Seven Weeks Ahead of News

CHINA'S Christmas earthquake disaster, whose deaths in Kansu Province were recently variously reported by cable as numbering from a few hundred to 70,000 sent its own reports by much faster methods, and they were read and correctly interpreted by scientists on the day of the catastrophe itself.

Within a few hours after the earthquake occurred, eight seismological stations in widely separated parts of the world wired and radioed the facts of their instrumental records to Science Service. Scientists of the U. S. Coast and Geodetic Survey interpreted the data, and stated that they indicated a "very severe earthquake that was probably extremely destructive to life and property" in the interior of China. The latitude and longitude as thus calculated correspond exactly with the locations now being reported by cable.

This is the second time that a disastrous earthquake in that same region has sent its own report, via the sensitive instrument in seismological observatories, weeks ahead of the delayed cable news. On May 22, 1927, an even greater catastrophe, in which a hundred

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thousand Chinese perished, occurred in Kansu, and within eighteen hours its location had been determined and the statement made that loss of life and property would probably be very heavy. At the end of July a missionary priest finally found his way through a ruined and bandit-infested region to a telegraph wire and sent the first verbal confirmation of the scientists' prediction.

Similar "beats" have been scored by scientists and seismographs over reporters and telegraphs in several other notable earthquakes during recent years. Data for these reports are gathered by Science Service and interpreted by the U. S. Coast and Geodetic Survey and the Jesuit Seismological Association, acting in cooperation with many seismological observatories in universities and other institutions in the United States and foreign countries.

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One of the most impressive looking agricultural implements is a combination corn picking and husking machine which handles two rows of corn at once, and does the work of a large force of men with only two or three attendants.

With the decline in quality of the iron ore of Great Lakes region, one engineer foresees that it will be necessary to import high grade iron ore from South America to mix with the local product and thus preserve the industry of the Lake states.

The National Conference on Merchant Marine was told that less than ten per cent. of the American merchant fleet is new, that is, built since 1922, whereas the fleets of Germany, Norway, Great Britain, Holland, and Sweden are more than 50 per cent. modern and new.

ECONOMICS

Industrial Survey Necessary Prelude to Technologic Rule

This is the fourth article of a series presented to illuminate the backgrounds and objectives of the movement that has found expression in the discussion of Technocracy. The material is given as information and news, not as our opinion or with our endorsement. The next article will give Professor Soddy's views on money, banks and currency.

THE ORGANIZATION of a suitable self-selected group of economists and technicians.

An inquiry into available ways, means and personnel.

A working-out of a common understanding and solidarity of sentiment between technicians and labor.

These are three essential practical steps listed by Thorstein Veblen when in 1919 he visualized a "soviet of technicians" that might rule the nation.

The organization of Technocracy in New York that has captured public imagination is believed by some to be an actual attempt to work out the first two of these steps.

In addition to the self-appointed organization of technicians, their charting of the nation's needs in industry, and the marshalling of technically trained men and women to operate the wheels of civilization, Veblen saw the need of an extensive campaign of inquiry and publicity that would bring to the underlying population a reasonable understanding of what it is all about. Another prerequisite of any overturn of the established order of absentee ownership is the active adherence of the trained workmen in transportation and the mechanical industries.

How would the technicians take control, once they are ready to act? Veblen suggested "a conscientious withdrawal of efficiency, that is to say the general strike, to include so much of the country's staff of technicians as will suffice to incapacitate the industrial system at large by their withdrawal, for such time as may be required to enforce their argument."

"By themselves alone," he wrote, "the technicians can, in a few weeks, effectually incapacitate the country's productive industry sufficiently for the purpose. No one who will dispassionately consider the technical character of this industrial system will fail to recognize that fact. But so long as they have not, at least, the tolerant consent of the population at large, backed by the aggressive support of the trained working force engaged in transportation and in the greater primary industries, they will be substantially helpless to set up a practicable working organization on the new footing; which is the same as saying that they will in that case accomplish nothing more to the purpose than a transient period of hardship and dissension."

Wealth From Energy and Diligence

The production of wealth, as distinct from debt, demands a continuous supply of fresh energy and continuous human diligence, nowadays, rather than physical labor.

This idea was put forth by Prof. Frederick Soddy, eminent British chemist and Nobel prizeman, in his 1926 book, "Wealth, Virtual Wealth and Debt."

Prof. Soddy is called a prophet of Technocracy. The Technocracy movement has emphasized the basic nature of energy in the machine age, but it has not accented the human diligence factors to which Prof. Soddy gives equal value.

Prof. Soddy in recent years has applied scientific method to economics. In the same spirit that he conducted

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RADIO

The Science Service radio address next week will be on the subject

PLANTS OF THE DUNES

by

Prof. George D. Fuller

of the Department of Botany of the University of Chicago

FRIDAY, FEB. 24

at 12:45 P. M. Eastern Standard Time

Over Stations of

The Columbia Broadcasting System

his chemical researches that led to the discovery of isotopes, those varieties of a chemical element that differ only in atomic weight, Prof. Soddy has studied economics.

As a result he developed principles which if introduced into practice would, in his opinion, bring about what might be called a beneficial rule by technology or applied science.

Fundamental to the Soddy concept of economics is the idea that the production of wealth obeys the physical laws of conservation and that the exact reasoning of the physical sciences can be applied. The scale on which wealth can be produced, Prof. Soddy said, is practically limited only by the state of technical knowledge.

"There is no longer any valid physical justification for the continuance of poverty," Prof. Soddy wrote. "The phenomenon of unemployment and destitution at one and the same time today is solely due to ignorance of the nature of wealth and the principles of economics, and to the confusions between wealth and debt which have hitherto bemused that subject, even among those who have essayed its scientific investigation and elucidation."

Prof. Soddy pointed out that there are two distinct categories of wealth which owe their value to the opposite qualities of perishability and permanence. Both of these are alike in their manner of production.

But in the formation of the perishable wealth the energy required is stored up for use later by life when the wealth is consumed. This perishable wealth can only be used once, it actually supports life and it includes food, fuel, explosives, fertilizers and all such materials.

The permanent wealth does not have energy stored within it, but energy has already gone to waste in the process of its making. Prof. Soddy explained that it "enables and facilitates life but does not empower it." Within this category of wealth are all the machines, all our permanent possessions, all the organs of production in industry and elsewhere. The permanent wealth is the "capital" of civilization in the true economic sense, not the monetary sense.

"By saving to an indefinite extent the expenditure of human time in production," Prof. Soddy said of capital in this sense, "capital appears to afford a continuous revenue of wealth without further work, but the origin of the wealth produced is in the continued use of capital by human agents, not in the capital itself. There is no ethical principle to which to appeal, in order to equate the time spent in the accumulation against the continuous expenditure necessary to make it productive, or to determine the just division of the wealth produced as between the capitalist and the worker."

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ARCHAEOLOGY

Princeton Expedition Unearths Mosaic Floor

SCENES of brave hunters facing wild animals are revealed on a large mosaic pavement unearthed at Daphne in Syria. A report received in Princeton says that the discovery was made by the committee for the excavation of Antioch and its vicinity, the headquarters of which are at Princeton University.

Exact antiquity of the important mosaic is not yet determined, but the spirit of the drawing has led archaeologists to assign it to the late third or fourth century A.D. The expedition will excavate the building completely this spring.

One large mosaic panel of the pavement, about 23 feet square, depicts hunters on land. A smaller panel depicts hunters at sea. A central medallion contains a bust named "Megalopsychia" in reference to the great mental courage of the hunters in meeting the beasts. The border, now badly damaged, represented scenes from Daphne.

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ENTOMOLOGY

NATURE RAMBLINGS *by Frank Thone*

Surviving Flies

WE ARE ALL familiar with the few furtive flies that flit and crawl about the corners of our houses all winter long, usually disregarded, living along somehow until warmer weather comes again. There are probably more flies that do not thus make themselves evident, but lurk torpidly in corners, moving little or not at all—really hibernating insects.

Such flies are believed by many entomologists to be the starting-points of the swarming myriads that make such intolerable pests of themselves all during the warm seasons. Other scientists disagree, and believe that flies start from eggs or pupae left in manure over winter. In any case, however, each year's crop of flies undoubtedly does start from a relatively small focus of surviving insects.

Flies can spring from nearly nothing to a universally distributed pest in a few weeks because of their amazingly rapid powers of multiplication. The fly lays many eggs, and at the same time has one of the shortest life cycles among insects.

Depending mainly on temperature conditions, but to some extent on other factors also, the fly egg hatches in from eight to thirty hours after it is laid. The larva or maggot feeds and fattens for from five to fourteen days. Then it transforms itself into a pupa, which stages lasts for from three to ten days. The adult insect that emerges from the pupa-case lives for from two to 23 days before egg production begins. Under the most favoring circumstances, therefore, the time from newly deposited egg to egg-producing adult can be as little as one week.

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First Glances at New Books

Electrical Engineering

MODERN COMMUNICATION—A. W. Page and others—*Houghton Mifflin,* 182 p., $2.75. Seven authorities from the great research organization that backs America's telephones and other electrical communication devices here tell of the latest developments in television, talking pictures, radio, telephone and other methods of electrical communication. The papers forming the chapters were delivered as lectures to the Lowell Institute, Boston.

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Medical Economics

HOW TO BUDGET HEALTH: GUILDS FOR DOCTORS AND PATIENTS—Evans Clark—*Harper,* 328 p., $4. Mr. Clark presents a plan for medical guilds. He also describes briefly the various schemes for reducing medical care costs that have been tried in this country and abroad, and recounts facts about the present state and cost of medical care in this country which the Committee on the Costs of Medical Care presented in its various publications. Whatever may be said of the guild plan, the discussion in this book seems superficial and the index is not very helpful.

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Engineering

BEHEMOTH: THE STORY OF POWER—Eric Hodgins and F. Alexander Magoun—*Doubleday, Doran,* 354 p., $3.50. A somewhat breezy story of the development of "the machine" from the first human treadmill to the latest and mightiest turbines. Informative and especially worth reading now during the trial of the civilization made by technology, though readers with even slight technical knowledge may be wearied by "over-popularization."

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Physics

ELEMENTS OF OPTICS—Joseph Valasek—*McGraw-Hill,* 254 p., $2.25. The second edition of a textbook suitable for use in a short beginning course of college grade.

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Mineralogy

THE FORM AND PROPERTIES OF CRYSTALS—A. B. Dale—*Cambridge University Press,* 186 p., $1.60. Comprehensive, yet concise and relatively inexpensive, is this book written for first year students taking mineralogy and crystallography. It is an introduction to the study of minerals, and the use of the petrological microscope, written by the Fellow and Tutor of Newnham College, Cambridge, England.

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Physics-Astronomy

ATOM AND COSMOS—Hans Reichenback, translated by Edward S. Allen—*Macmillan,* 300 p., $2. Space and time, light and radiation, matter, and the philosophical consequences of modern physics are discussed by the professor of natural philosophy at the University of Berlin, through translation by the associate professor of mathematics of the Iowa State College. The book contains the substance of a series of radio addresses delivered in Berlin, and it will interest the audience of such books as those recently issued by Eddington and Jeans.

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Sociology

TRAFFIC IN OPIUM AND OTHER DANGEROUS DRUGS—*U. S. Government Printing Office,* 94 p., 15c. Report by the Government of the United States of America for the year ended Dec. 31, 1931. Contains information valuable to those interested in this important subject from the social and legal angles.

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Psychology

THE ART OF FEELING—Horace G. Wyatt—*Houghton Mifflin,* 293 p., $2.50. The author, a British psychologist now at Stanford University, stresses in this philosophical work the need for control of emotions and character building.

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Radio

RADIO ENGINEERING—Frederick Emmons Terman—*McGraw-Hill,* 688 p., $5. A college text that presents a comprehensive engineering treatment of the more important vacuum tube and radio phenomena. It is written by the associate professor of electrical engineering at Stanford University.

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Mathematics

THE NEW APPLIED MATHEMATICS—Sidney J. Lasley and Myrtle F. Mudd—*Prentice-Hall,* 439 p., $1.60. Unlike most books on this subject, this one looks interesting. Although designed for use in junior and senior high schools, many adults and even business men and clerical workers would be greatly benefited if they read it and did the exercises. It is practical in that it meets personal needs that are encountered in one's everyday experience. The book treats such phases of arithmetic, business, geometry, and algebra as will be worth while for any student, regardless of his future occupation. The first part of the book covers everyday arithmetic and business transactions under the following chapter headings: Short Cuts and Proofs, Business Organizations—Problems of the Merchant, Business and Personal Records, Banks and Banking Procedure, Insurance, Means of Communication — Telephone and Telegraph, Postal Information, Means of Travel. The second and third portions of the book are devoted to geometry and algebra with many practical examples of the usefulness of these branches of mathematics.

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General Science

ANNUAL REPORT OF THE SMITHSONIAN INSTITUTION, 1931—*Government Printing Office,* 592 p., $1.75. The general appendices to the Annual Report of the Smithsonian Institution are notable summaries of current science and the twenty-six accounts included in the appendix to this report maintain the standards of past years.

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Geology

SUMMARY INFORMATION ON THE STATE GEOLOGICAL SURVEYS AND THE UNITED STATES GEOLOGICAL SURVEY—Committee on State Geological Surveys—*National Research Council,* 136 p., $1. Since the State and Federal geological surveys are the principal research agencies in geology in this country, this publication is a key to this field.

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